

# **Experimental Investigations of the Physical & Optical Properties of Individual Micron/Submicron-Size Dust Grains in Astrophysical Environments**

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## **Abstract:**

Dust grains constitute a significant component of matter in the universe, and play an important and crucial role in the formation and evolution of the stellar/planetary systems in interstellar dust clouds. Knowledge of physical and optical properties of dust grains is required for understanding of a variety of processes in astrophysical and planetary environments. The currently available and generally employed data on the properties of dust grains is based on bulk materials, with analytical models employed to deduce the corresponding values for individual small micron/submicron-size dust grains. However, it has been well-recognized over a long period, that the properties of individual small-size dust grains may be very different from those deduced from bulk materials. This has been validated by a series of experimental investigations carried out over the last few years, on a laboratory facility based on an Electrodynamic Balance at NASA, which permits levitation of single small-size dust grains of desired composition and size, in vacuum, in simulated space environments.

In this paper, we present a brief review of the results of a series of selected investigations carried out on the analogs of interstellar and planetary dust grains, as well as dust grains obtained by Apollo-11-17 lunar missions. The selected investigations, with analytical results and discussions, include: (a) Direct measurements of radiation on individual dust grains (b) Rotation and alignments of dust grains by radiative torque (c) Charging properties of dust grains by: (i) UV Photo-electric emissions (ii) Electron Impact. The results from these experiments are examined in the light of the current theories of the processes involved.